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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte JUNG KEUN KIM, JEONG DAE SEO, HYUN CHEOL JEONG, CHUN GUN PARK, JONG KWAN BIN, KYUNG HOON LEE, and SUNG HOON PIEH

Appeal 2012-007193
Application 11/593,148
Technology Center 1700

Before CHUNG K. PAK, CATHERINE Q. TIMM, and BEVERLY A. FRANKLIN, *Administrative Patent Judges*.

PAK, *Administrative Patent Judge*

DECISION ON APPEAL

The named inventors (hereinafter "Appellants")[1] appeal under 35 U.S.C. § 134 from the Examiner's final rejection of claims 5 through 11, all of the claims pending in the above-identified application. We have jurisdiction pursuant to 35 U.S.C. § 6(b).

We affirm.

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[1] Appellants identify the real party in interest as LG Display Co., Ltd. of Seoul, Korea. (*See* Appeal Brief filed November 17, 2011 ("App. Br.") at 2.)

STATEMENT OF THE CASE

The subject matter on appeal is directed to "red light-emitting phosphorescent compounds . . . and organic electroluminescent (EL) devices using the same." (Spec. 2, ¶ [0002].) The "organic electroluminescent (EL) devices with high color purity, high luminance and long lifetime" are said to be formed by using any one of the compounds included in Formulas 1 to 4 described in the Specification as a dopant of its light-emitting layer. (Spec. 6, ¶¶ [0016] and [0017].) Formulas 1 to 4 encompass thousands or possibly millions of compounds as apparent from the description at pages 7 through 27 of the original Specification. Details of the appealed subject mattered are recited in illustrative claims 5, 8, 9, 10, and 11[2] reproduced from the Claims Appendix to the Appeal Brief as shown below:

5. An organic electroluminescent (EL) device comprising

an anode,

a hole injecting layer,

a hole transport layer,

a light-emitting layer,

an electron transport layer,

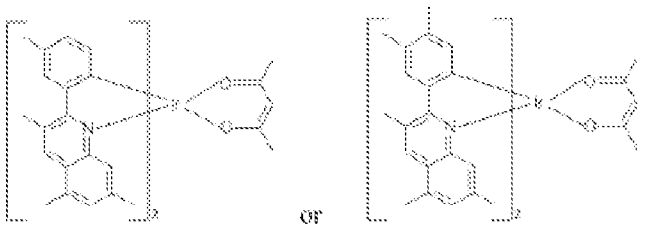
an electron injecting layer, and

a cathode

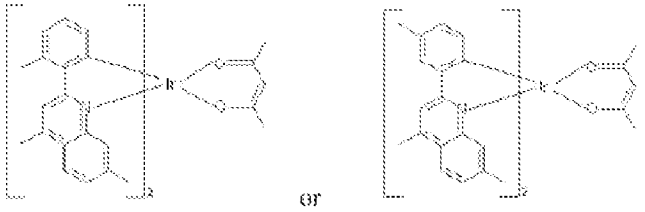
[2] For purposes of this appeal, to the extent that the claims on appeal are separately argued, we will address them separately consistent with 37 C.F.R. § 41.37(c)(1)(vii).

laminated in this order wherein the red phosphorescent compound according to claim 8 is used as a dopant of the light-emitting layer and is present in an amount of 0.5 to 20% by weight, based on the weight of a host.

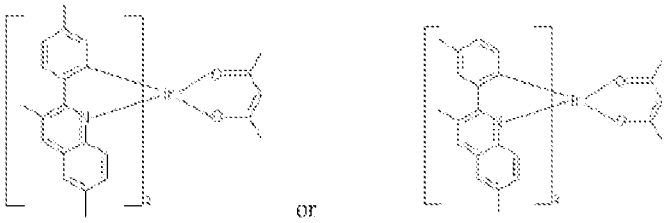
8. A red phosphorescent compound of Formula I below:



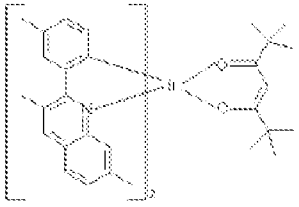
9. A red phosphorescent compound of Formula 2 below:



10. A red phosphorescent compound of Formula 3 below:



11. A red phosphorescent compound of Formula 4 below:



(App. Br. 21-22 (Claims App'x)).

Appellants seek review of the following grounds of rejection maintained by the Examiner in the Examiner's Answer mailed January 30, 2012 ("Ans."):

(1) Claims 5 through 10 under 35 U.S.C. § 103(a) as unpatentable over Kwong;[3] and

(2) Claim 11 under 35 U.S.C. § 103(a) as unpatentable over Kwong and Lecloux.[4] (*See* App. Br. 6.)

FACT FINDINGS, PRINCIPLES OF LAW, ANALYSES, and CONCLUSIONS

I. Obviousness Based on Kwong

Appellants contend that Kwong does not explicitly teach or disclose Appellants' compounds of claims 8 through 10. (App. Br. 7-11.) In particular, Appellants focus on the location of methyl substituents in the phenyl part and the quinoline part of the compounds recited in in claims 8 through 10. (*Id.*) Appellants also contend that the claimed subject matter imparts unexpected results. (*Id.* at 11-16.) In support of this contention, Appellants refer to Tables 1 through 4 and Figure 1 in Appellants' application to show that the sites of methyl substituents recited in claims 8 through 10 influence unexpected results in terms of high luminescence efficiency, high color purity, and luminescence lifetime. (*Id.*)

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[3] US 2003/0072964 A1 published in the name of Kwong et al. on April 17, 2003 ("Kwong").
[4] WO 03/040256 A2 published in the name of Lecloux et al. on May 15, 2003 ("Lecloux").

Thus, the dispositive questions raised here are:

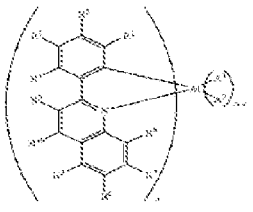
(1) Has the Examiner reversibly erred in determining that the teachings of Kwong as a whole would have led one of ordinary skill in the art to arrive at the compounds recited in claims 8 through 10?

(2) Has the Examiner reversibly erred in determining that the teachings of Kwong as a whole would have led one of ordinary skill in the art to employ the compounds recited in claim 8 as a dopant in the emissive layer of an organic electroluminescent device as recited in claims 5 through 7?

(3) Has the Examiner reversibly erred in determining that Appellants have not demonstrated that the showing in the instant application is sufficient to outweigh the evidence of obviousness reflected in the teachings of Kwong?

On this record, we answer these questions in the negative substantially for the reasons set forth by the Examiner in the Answer. We add the following primarily for emphasis and completeness.

As is apparent from the record, there is no dispute that Kwong teaches phosphorescent compounds embraced by formula 1 below:



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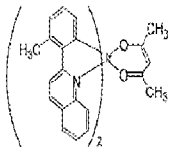
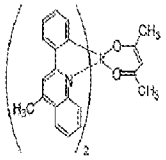
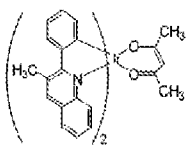
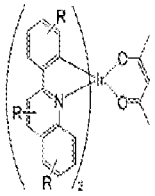
wherein R^1, R^2, R^3, R^4, R^5, R^6, R^7, R^8, R^9, and R^{10} can be, *inter alia*, hydrogen and methyl, thus encompassing the phosphorescent compounds recited in claims 8 through 10. (*Compare* Ans. 5-6 *with* App. Br. 7-8.) Nor

is there any dispute that Kwong teaches preference for phosphorescent compounds identified by the formulas below:


Compound 3


Compound 11


Compound 12


Figs. 3 & 4

These specific phosphorescent compounds taught by Kwong are either structurally similar to or encompass the phosphorescent compounds recited in claims 8 through 10 as well. (*Compare* Ans. 5-6 *with* App. Br. 7-8; *see also* Kwong, Figs 1-4.)

As found by the Examiner at pages 6, 11, and 12 of the Answer, Kwong also teaches that emission color can be deliberately controlled or tuned, i.e., red-shifted or blue-shifted, upon judicious selection of substituents and substitution sites from those listed and that emission color of exemplified phosphorescent compounds 1-13 shown in Figures 1 and 2 (which are structurally similar to those disclosed and claimed by Appellants) range from orange to deep red, with phosphorescent compound 11 discussed *supra* as providing orange-red emission. (Kwong, ¶¶ [0171], [0172], and [0187].) Kwong also teaches that phosphorescent compounds comprising iridium can provide red emission. (*Id.* at ¶ [0179].)

Kwong further discloses employing 1 to about 20% by weight of these phosphorescent compounds as a dopant in the emissive layer of an organic light emitting device (organic electroluminescent device[5]), which includes

[5] Appellants do not question that the organic light emitting device taught by Kwong is an organic electroluminescent (EL) device. (*Compare* Ans. 6 *with* App. Br. 6-18; *see also* Kwong, ¶¶ [0004] and [0179].)

an anode, a cathode, a hole injection layer, a hole transport layer, a light-emitting layer (emissive layer), an electron transport layer, and an electron injection layer. (Ans. 6 and Kwong, ¶¶ [0085], [0176], [0180], [0181], and [0187].) Notwithstanding Appellants' arguments to the contrary at page 18 of the Appeal Brief, Kwong clearly teaches employing, *inter alia*, CBP (carbazole derivative) or Alq_3 or BAlq (aluminum complex having at least quinolyl or at least methyl quinolyl group) as an organic host material in the emissive layer of its organic electroluminescent device as required by claims 6 and 7. (Ans. 6 and Kwong, ¶ [0100] or [0187]; *see also* the examples in Appellants' Specification employing Alq_3 or BAlq as an organic host material.) Kwong teaches that this organic electroluminescent device employing such phosphorescent compounds for emitting red can have electroluminescence maxima of from about 550 to about 700 nm, a color index coordinates (CIE) ranging from about 0.5 to 0.8 for x and about 0.2 to about 0.5 for y (color coordinate for emitting red (e.g., increasing the wavelength of emission can also influence red-shift)), and external quantum efficiencies greater than about 12% or higher at a brightness greater than about 10, 100, 1000 cd/m^2, or more. (Kwong, ¶¶ [0086], [0101], [0170], [0171], and [0179].) In other words, Kwong, like Appellants, indicates that its organic electroluminescent devices employing particular phosphorescent compounds, inclusive of those claimed, have superior properties, such as high external quantum and luminous efficiencies, desired color purity, and extended device lifetimes, as compared with known devices. (*Compare* Kwong, ¶¶ [0178] and [0179] *with* Spec. 6, ¶¶ [0016] and [0017].)

Given the above teachings, we concur with the Examiner that one of ordinary skill in the art would have been led to select phosphorescent

compounds having methyl groups in the appropriate substitution sites, such as those recited in claims 8 through 10, from the phosphorescent compounds having such substituents at such substitution sites included in the formulas taught by Kwong as a dopant in the emissive layer of the organic electroluminescent device of the type taught by Kwong, with a reasonable expectation of successfully emitting the desired red hue. *See, e.g., Merck & Co., Inc. v. Biocraft Labs., Inc.*, 874 F.2d 804, 807 (Fed. Cir. 1989) ("That the '813 patent discloses a multitude of effective combinations does not render any particular formulation less obvious. This is especially true because the claimed composition is used for the identical purpose.").[6]

Appellants contend that the phosphorescent compounds recited in claims 8 through 10 impart unexpected results relative to the phosphorescent compounds described in Kwong. (App. Br. 11-12.) In support of this contention, Appellants refer to Table 1 at page 12 of the Appeal Brief, which

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[6] Note also that in addition to disclosing a multitude of phosphorescent compounds, inclusive of those claimed, for the claimed purpose, with some guidance regarding the selection of phosphorescent compounds structurally similar to those claimed as red emitters, Kwong further teaches that the type of substituents and the sites (locations) of such substituents in the phenol and quinolone parts of the phosphorescent compounds, including using iridium as M, are known result-effective variables for emitting the desired red hue as indicated *supra*. *See, e.g., In re Applied Materials, Inc.*, 692 F.3d 1289, 1297 (Fed. Cir. 2012) ("A recognition in the prior art that a property is affected by the variable is sufficient to find the variable result-effective.") Thus, the selection of methyl substituents for the appropriate phenyl and quinolone sites of the phosphorescent compounds from those listed in Kwong is also well within the ambit of one of ordinary skill in the art. *See* Kwong, ¶ [0185]; *In re Boesch*, 617 F.2d 272, 276 (CCPA 1980) (holding that optimization of a result effective variable is ordinarily within the ambit of one of ordinary skill in the art).

is said to be derived from Tables 1 through 4 of the Specification.[7] (*Id.* at 12.) According to Appellants, the showing in Tables 1 through 4 of the Specification indicates that the use of the claimed phosphorescent compounds allows an organic electroluminescent device to unexpectedly obtain high luminescence efficiency, high red purity, and long luminescence lifetime simultaneously. (*Id.* at 12-15.) Appellants refer to Figure 5 at page 15 of the Appeal Brief which is said to be derived from Figure 1 of the instant application to show the difficulty of enhancing both efficiency and red purity simultaneously due to relative sensitivity becoming "lower as the wavelength increases between yellow green and red . . . ." (*Id.* at 14-15.)

"[W]here the prior art gives reason or motivation to make the claimed [invention] . . . the burden (and opportunity) then falls on an applicant to rebut that *prima facie* case. Such rebuttal or argument can consist of . . . any other argument or presentation of evidence that is pertinent." *In re Dillon*, 919 F.2d 688, 692-93 (Fed. Cir. 1990) (*en banc*). Consistent with the above guidance set forth in *Dillon*, the burden of demonstrating unexpected results is placed on the party who asserts them. *In re Geisler*, 116 F.3d 1465, 1470 (Fed. Cir. 1997); *In re Klosak*, 455 F.2d 1077, 1080 (CCPA 1972).

Here, as found by the Examiner at pages 13-14 of the Answer, Appellants have not compared the claimed subject matter with the closest prior art, namely Kwong's exemplified phosphorescent compounds (compounds 3, 11, and 12 discussed above) which are structurally similar to

[7] Appellants do not rely on the Declaration referred to by the Examiner at page 14 of the Answer as a basis for establishing unexpected results. (App. Br. 11-16.) Thus, we need not consider such Declaration in resolving the propriety of obviousness of the claimed subject matter. To the extent we need to consider such Declaration, we adopt the Examiner's undisputed finding at page 14 of the Answer as our own.

or closest to the claimed compounds. In this regard, we note that Appellants have not disputed the Examiner's finding that the showing in Tables 1 to 4 of the Specification only provides a comparison between the claimed compounds and $(btp)_2Ir(acac)$ having a sulfur containing ligand, which is not structurally or chemically closer to the claimed compounds than those exemplified by Kwong having improved high luminescence efficiency, high red purity, and long luminescence lifetime. (*Compare* Ans. 13 *with* App. Br. 12-15; *compare also* Kwong, ¶¶ [0178], [0179], [0187], and [0189] with Spec. 43-44, ¶ [0096], 49, ¶ [00120], 54, ¶ [00144], and 59, ¶ [00165].) Nor have Appellants disputed the Examiner's finding that phosphorescent compounds designated as R-2 to R-5, inclusive of Kwong's compound 12, in Table 1 at page 12 of the Appeal Brief has no factual support in Tables 1 to 4 of the Specification. *In re Mehta*, 347 F.2d 859, 866 (CCPA 1965) (explaining that unsworn exhibits are treated as arguments); *In re Borkowski*, 505 F.2d 713, 718 (CCPA 1974) (A mere pleading unsupported by proof or showing of facts is inadequate.); *In re Geisler*, 116 F.3d at 1470 ("[A]ttorney argument [is] not the kind of factual evidence that is required to rebut a prima facie case of obviousness."). Moreover, none of the phosphorescent compounds designated as R-2 to R-5 is phosphorescent compound 11 exemplified by Kwong, which is closest to the claimed subject matter in terms of performance and structure. (Ans. 15 and Kwong, ¶ [0187], Table 1.) Thus, we concur with the Examiner that Appellants have not demonstrated that the claimed compounds impart unexpected results relative to the closest prior art. *In re Baxter Travenol Labs.*, 952 F.2d 388, 392 (Fed. Cir. 1991) ("[W]hen unexpected results are used as evidence of nonobviousness, the results must be shown to be unexpected compared with

the closest prior art.")

Moreover, as found by the Examiner at pages 12-13 of the Answer, Appellants have not demonstrated that the showing in Tables 1 through 4 and Figure 1 in the instant application is reasonably commensurate in scope with the degree of protection sought by the claims on appeal. While the showing is limited to using an organic electroluminescent device employing specific amounts of particularly deposited specific mixtures of various specific chemical compounds, including 7% of the claimed phosphorescent compounds designated as R-6, R-7, R-8, and R-9 as a dopant and unknown specific amounts of specific organic host materials, on an ITO-coated glass substrate, the claims on appeal are not so limited. On this record, Appellants have not shown that the unexpected results allegedly achieved with Appellants' organic electroluminescent devices are primarily due to the claimed phosphorescent compounds. It cannot be ascertained from the showing relied upon whether the alleged unexpected results are due to the claimed phosphorescent compounds as alleged, the unknown amounts of unknown host materials employed, the unknown amount and/or thicknesses of light emitting layers used, or the types of hole injection layers, hole transport layers, electron transport layers, and electron injection layers employed in the organic electroluminescent devices supposedly representative of the closest prior art and the claimed subject matter. (Ans.13.) *In re Dunn*, 349 F.2d 433, 439 (CCPA 1965) ("While we do not intend to slight the alleged improvements, we do not feel it an unreasonable burden on appellants to require comparative examples relied on for non-obviousness to be truly comparative. The cause and effect sought to be proven is lost here in the welter of unfixed variables.") Nor have Appellants

shown that the unexpected resulted allegedly achieved with using a specific amount of only one of the phosphorescent compounds recited in claims 8 through 10 in Appellants' organic electroluminescent devices are reasonably expected to be applicable to the different amounts of the other phosphorescent compounds not tested, but included in claims 8 through 10. *See, e.g.*, *In re Harris*, 409 F.3d 1339, 1344 (Fed. Cir. 2005) ("Even assuming that the results were unexpected, Harris needed to show results covering the scope of the claimed range. Alternatively Harris needed to narrow the claims."); *In re Greenfield*, 571 F.2d 1185, 1189 (CCPA 1978) (*quoting In re Tiffin*, 448 F.2d 791, 792 (CCPA 1971)) ("Establishing that one (or a small number of) species gives unexpected results is inadequate proof, for 'it is the view of this court that objective evidence of non-obviousness must be commensurate in scope with the claims which the evidence is offered to support.'")

Accordingly, based on the totality of evidence of record, including due consideration of Appellants' arguments and evidence anew, we find no reversible error in the Examiner's determination that the showing in the Specification is not sufficient to outweigh the evidence of obviousness reflected in the teachings of Kwong within the meaning of 35 U.S.C. § 103(a).

II. Obviousness Based on Kwong and Lecloux

Appellants have not disputed the Examiner's determination that it would have been obvious to employ the β-enolate (e.g., 2,4-pentadienedione) taught by Lecloux to form the claimed bidentate ligand as the bidentate ligand of the phosphorescent compounds taught by Kwong. (*Compare* Ans. 8-10 *with* App. Br. 16-17.) Appellants merely reiterate one

of the arguments advanced in connection with the § 103(a) rejection of claims 5 through 10 based on Kwong discussed above. (App. Br. 16-17.) In particular, Appellants contend that "Kwong does not disclose Appellants' compounds having at least one methyl substituent in the phenyl part and at least two methyl substituents in the quinoline part of the compound." (App. Br. 17 (emphasis original).)

Accordingly, based the same reasons set forth above and in the Answer, we find no reversible error in the Examiner's determination that the collective teachings of Kwong and Lecloux would have led one of ordinary skill in the art to the phosphorescent compound recited in claim 11 within the meaning of 35 U.S.C. § 103(a).

ORDER

Upon consideration of the record, and for the reasons given above and in the Answer, it is

ORDERED that the Examiner's decision rejecting the claims on appeal under 35 U.S.C. § 103(a) is AFFIRMED; and

FURTHER ORDERED that no time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a) (2010).

AFFIRMED

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